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FORTHCOMING PAPERS

The following papers will be published in future issues:

Sze-Chin Shee, Some results on λ-valuation of graphs involving complete bipartite graphs.

In this paper we show that a graph G obtained from a complete bipartite graph $K_{m,n}$ and a collection of q ($\leqslant \max\{m, n\}$) stars G_i by joining the centre of G_1 to every vertex of $K_{m,n}$ and joining the centre of G_i to a vertex (not the centre) of G_{i+1} ($i = 1, 2, \ldots, q-1$) is strongly harmonious. We also prove that a graph obtained from a collection of t complete bipartite graphs K_{m_i,n_i} with bipartition (X_i, Y_i) by joining exactly one member in Y_i with a member in X_{i+1} ($i = 1, 2, \ldots, t-1$) is strongly c-elegant. The windmill graph $K_{2,2}^{(n)}$ of n complete bipartite graphs $K_{2,2}$ with a common vertex is also shown to be harmonious for all $n \geqslant 2$.

Peter J. Cameron, Several 2-(46, 6, 3) designs.

A simple construction produces designs with the parameters of the title, which are extensions of the generalised quadrangle of order (4, 2). The construction also works for two related parameter sets. A feature of the construction is the large number of non-isomorphic designs it produces.

S.A. Choudum, On graphic and 3-hypergraphic sequences.

In this paper we give a necessary condition for a sequence π of integers to be 3-hypergraphic. This necessary condition is on the lines of Erdős and Gallai conditions for graphic sequences and depends on a function M_r defined on π.

Hiroshi Maehara, Note on the intersection graph of random sets.

Let X_i, $i = 1, \ldots, n$, be $n = n(N)$ independent random subsets of $\{1, 2, \ldots, N\}$, each selected at random out of the 2^N subsets. We present some asymptotic ($N \to \infty$) properties of $\{X_i\}$, e.g. if $n/2^{N/3} \to \infty$ then $\{X_i\}$ contains mutually disjoint three sets, while if $n/2^{N/3} \to 0$ then $\{X_i\}$ contains no such three sets, almost surely.

V.I. Rodionov, On the number of labeled acyclic digraphs.

Let $A_n(x)$ denote the generating function for all labeled acyclic digraphs of order n, i.e. $A_n(x) = \sum_{r=0}^{\infty} A_{nr} x^r$, where A_{nr} is equal to the number of labeled acyclic digraphs on n points with r arcs. The following recurrence holds

$$\sum_{m=1}^{n} (-1)^{m-1} \binom{n}{m} (1+x)^{m(n-m)} A_m(x) = 1.$$

The generating function

$$A(t) \stackrel{\text{def}}{=} \sum_{n=0}^{\infty} \frac{A_n}{n!} 2^{-\binom{n}{2}} t^n$$

(where $A_n = A_n(1)$ is the number of labeled acyclic digraphs of order n) is given by the formula

$$A(t) = \left(\sum_{m=0}^{\infty} \frac{(-1)^m}{m!} 2^{-\binom{m}{2}} t^m \right)^{-1}.$$

Liang Sun, On a problem of J. Csima.

A problem of J. Csima on the factorization of regular bipartite graphs is settled.

Jin Akiyama and Vašek Chvátal, Packing paths perfectly.

We characterize a class of graphs in which the largest number of vertex-disjoint paths of length two can be found in polynomial time. Membership in this class can be tested in polynomial time.

Jacques Désarménien et Dominique Foata, Statistiques d'ordre sur les permutations colorées.

Un calcul explicite de distributions de statistiques d'ordre sur les permutations colorées est obtenu à l'aide de l'algèbre des fonctions de Schur.

An explicit calculation of distributions of order statistics on colored permutations is derived by means of the Schur function algebra.

Tom Greene, Descriptively sufficient subcollections of flats in matroids.

A concept of descriptive sufficiency is introduced to characterize the subcollections of flats from which the key properties of a matroid can be determined by certain convenient conditions. The concept of descriptive sufficiency is related to the essential flats, and an algorithm is proposed which constructs the erections of an arbitrary matroid in terms of a particular descriptively subcollection of flats.

Christos Koukouvinos and Stratis Kounias, Construction of some Hadamard matrices with maximum excess.

Let $\sigma(n)$ be the maximum excess of an Hadamard matrix of order n. Hadamard matrices with maximum excess are constructed for the following cases:

(i) $n = (4m+1)^2 + 3$ for $m = 8, 13, 18$ with $\sigma(n) = n(4m+1) = n\sqrt{n-3}$,

(ii) $n = (4m+3)^2 + 3$ for $m = 3, 4, 5, 12$ with $\sigma(n) = n(4m+3) = n\sqrt{n-3}$,

(iii) $n = 4(2m+1)^2$ for $m = 10, 16, 18$ with $\sigma(n) = n(4m+2) = n\sqrt{n}$.

Felix Lazebnik, Some corollaries of a theorem of Whitney on the chromatic polynomial.

Let $\mathbb{F}$ denote the family of simple undirected graphs on v vertices having e edges, $P(G;\lambda)$ be the chromatic polynomial of a graph G. For the given integers v, e, λ, let $f(v, e, \lambda) = \max\{P(G;\lambda)\colon G \in \mathbb{F}\}$. In this paper we determine some lower and upper bounds for $f(v, e, \lambda)$ provided that λ is sufficiently large. In some cases $f(v, e, \lambda)$ is found and all graphs G for which $P(G;\lambda) = f(v, e, \lambda)$ are described. Connections between these problems and some other questions from the extremal graph theory are analysed using Whitney's characterization of the coefficients of $P(G;\lambda)$ in terms of the number of "broken circuits" in G.

Wei Ping Liu and Ivan Rival, Inversions, cuts, and orientations.

Any reorientation of the diagram of an ordered set reverses the direction of some of the edges. However, not all subset of edges, when reversed, can produce a diagram. We show that reversing the edges of a "cut" does produce a diagram and that any such reorientation may be constructed by a familiar sequential algorithm. We apply this to the enumeration and complexity of reorientations.

Laura A. Sanchis, Maximum number of edges in connected graphs with a given domination number.

A *dominating set* for a graph $G = (V, E)$ is a subset of vertices $V' \subseteq V$ such that for all $v \in V - V'$, there exists some $u \in V'$ for which $\{v, u\} \in E$. The *domination number* of G is the size of its smallest dominating set(s). In this paper we give an upper bound on the number of edges a connected graph with a given number of vertices and a given domination number can have. We also characterize the extremal graphs attaining this upper bound.

Martin Škoviera, The maximum genus of graphs of diameter two.

Let G be a (finite) graph of diameter two. We prove that if G is loopless then it is upper embeddable, i.e. the maximum genus $\gamma_M(G)$ equals $\lfloor \beta(G)/2 \rfloor$, where $\beta(G) = |E(G)| = |V(G)| + 1$ is the Betti number of G. For graphs with loops we show that $\lceil \beta(G)/2 \rceil - 2 \leqslant \gamma_M(G) \leqslant \lfloor \beta(G)/2 \rfloor$ if G is vertex 2-connected, and compute the exact value of $\gamma_M(G)$ if the vertex-connectivity of G is 1. We note that by a result of Jungerman [2] and Xuong [10] 4-connected graphs are upper embeddable.

Guo-Zhen Xiao, Ba-Zhong Shen, Chuan-Kun Wu and Chi Song Wong, Some spectral techniques in coding theory.

Let f be a real-valued function on the n-dimensional linear space F^n over $F = \{0, 1\}$ and let A be a linear transformation of F^n into F^m. The Walsh spectrum of the composite $f \circ A$ is obtained. In particular, the Walsh spectrum of the degenerated function of f is obtained. Certain known related results are generalized.

Mieko Yamada, Hadamard matrices of generalized quaternion type.

Let G be a semi-direct product of a cyclic group of an odd order by a generalized quaternion group Q_S. We consider the ring $\mathfrak{R}$ obtained from the group ring ZG by identifying the elements ± 1 in the center of Q_S with ± 1 of the rational integer ring Z. If the right regular representation matrix of an element in $\mathfrak{R}$ is an Hadamard matrix, we call this an Hadamard matrix of generalized quaternion type.

An Hadamard matrix generated by the Paley type 1 matrix is Seidel-equivalent to an Hadamard matrix of generalized quaternion type, bound by some conditions. When the order of generalized quaternion group is minimum, i.e. when Q_S is the quaternion group, then an Hadamard matrix of generalized quaternion type is exactly an Hadamard matrix of type Q. See N. Ito, Note on Hadamard matrices of type Q, *Studia Scientiarum Mathematicarum Hungarica* 16 (1981) 389–393. Moreover, if the four component matrices of an Hadamard matrix of type Q are symmetric, then this becomes an Hadamard matrix of Williamson type.

The purpose of this paper is to prove the existence of some infinite series of Hadamard matrices of generalized quaternion type. The theory of relative Gauss sum is very important for the construction of our infinite series.

In the last section, we give examples of Hadamard matrices of generalized quaternion type of order 24 in detail.

Zhu Yong-jin, Tian Feng and Deng Xiao-tie, More powerful closure operations on graphs.

Bondy and Chvátal have observed the following result: $G=(V, E)$ is a simple graph of order n. If $uv \notin E$ and $d(u)+d(v) \geqslant n$, then G is hamiltonian iff $G+uv$ is hamiltonian. Thus, we can obtain a graph $C_n(G)$, named the n-closure of G, from G by successively joining pairs of non-adjacent vertices whose degree sum is at least n. Therefore, G is hamiltonian if $C_n(G)$ is hamiltonian. Moreover, Bondy and Chvátal generalized this idea to several properties on G [2]. In the paper, we present some powerful closure operations that extend the idea of Bondy and Chvátal.

M.F. Janowitz, A converse to the Sholander embedding

It is both a well-known and useful fact that every median semilattice M may be embedded into a distributive lattice D so that M is an order ideal of D, and every element of M is the join of finitely many elements of D. However, the converse of this assertion is false. The present paper establishes several sets of necessary and sufficient conditions for an order ideal of a distributive lattice to be a median semilattice.

D. Amar and A. Raspaud, Covering the vertices of a digraph by cycles of prescribed length.

Let D be a strong digraph with n vertices and at least $(n-1)(n-2)+3$ arcs.

For any integers $k, n_1, n_2, \ldots, n_k$ such that $n=n_1+n_2+\cdots+n_k$ and $n_1 \geqslant 3$, there exists a covering of the vertices of D by disjoint directed cycles of length $n_1, n_2, \ldots, n_k$ except in two cases:
Case 1. $n=6$; $n_1=n_2=3$ and D contains a stable set with 3 vertices.
Case 2. $n=9$; $n_1=n_2=n_3=3$ and D contains a stable set with 4 vertices.

B.A. Anderson, A product theorem for 2-sequencings.

It is shown that if a finite group G of odd order has what is called a starter-translate 2-sequencing and a finite group H has a 2-sequencing, then the group $G \times H$ has a 2-sequencing. This generalizes a theorem of Bailey. Special cases of this result can be applied to various questions involving sequencings of groups. For example, Keedwell has exhibited a class of non-Abelian groups of odd order that have sequencings. Some of these sequencings are starter-translate sequencings and it follows that the collection of odd positive integer orders for which there is a known non-Abelian sequenceable group (and hence a complete Latin square) can be substantially enlarged. New classes of non-Abelian groups with a unique element of order two are shown to have symmetric sequencings.